Sustainable Livestock Production in the Perspective of
Food Security, Policy, Genetic Resources, and Climate Change

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The 16th AAAP Congress

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Ministry of Agriculture

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Gadjah Mada University

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SUSTAINABLE LIVESTOCK PRODUCTION IN THE PRESPECTIVE OF FOOD SECURITY, POLICY, GENETIC RESOURCES, AND CLIMATE CHANGE

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AAAP

Asian-Australasian Association of Animal Production Societies

✧ **Scope of AAAP**: AAAP is established to devote for the efficient animal production in the Asian-Australasian region through national, regional, international cooperation and academic conferences.

✧ **Brief History of AAAP**: AAAP was founded in 1980 with 8 charter members representing 8 countries-those are Australia, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines and Thailand. Then, the society representing Taiwan joined AAAP in 1982 followed by Bangladesh in 1987, Papua New Guinea in 1990, India and Vietnam in 1992, Mongolia, Nepal and Pakistan in 1994, Iran in 2002, Sri Lanka and China in 2006 , thereafter currently 19 members.

✧ **Major Activities of AAAP**: Biennial AAAP Animal Science Congress, Publications of the Asian-Australasian Journal of Animal Sciences and proceedings of the AAAP congress and symposia and Acknowledgement awards for the contribution of AAAP scientists.

✧ **Organization of AAAP**:

· President: Recommended by the national society hosting the next biennial AAAP Animal Science Congress and approved by Council meeting and serve 2 years.

· Two Vice Presidents: One represents the present host society and the other represents next host society of the very next AAAP Animal Science Congress.

· Secretary General: All managerial works for AAAP with 6 years term by approval by the council

· Council Members: AAAP president, vice presidents, secretary general and each presidents or representative of each member society are members of the council. The council decides congress venue and many important agenda of AAAP

✧ **Office of AAAP:** Decided by the council to have the permanent office of AAAP in Korea. Currently # 909 Korea Sci &Tech Center Seoul 135-703, Korea

✧ **Official Journal of AAAP**: Asian-Australasian Journal of Animal Sciences (Asian-Aust. J. Anim. Sci. ISSN 1011-2367. http://www.ajas.info) is published monthly with its main office in Korea

✧ **Current 19 Member Societies of AAAP:**

ASAP(Australia)**, BAHA**(Bangladesh), **CAASVM**(China), **IAAP**(India), **ISAS**(Indonesia), **IAAS**(Iran), **JSAS**(Japan), **KSAST**(Korea), **MSAP**(Malaysia), **MLSBA**(Mongolia), **NASA**(Nepal), **NZSAP**(New Zealand), **PAHA**(Pakistan), **PNGSA**(Papua New Guinea), **PSAS**(Philippines), **SLAAP**(Sri Lanka), **CSAS**(Taiwan), **AHAT**(Thailand), **AHAV**(Vietnam).

✧ **Previous Venues of AAAP Animal Science Congress and AAAP Presidents**

I	1980	Malaysia	S. Jalaludin	II	1982	Philippines	V. G. Arganosa
III	1985	Korea	In Kyu Han	IV	1987	New Zealand	A. R. Sykes
V	1990	Taiwan	T. P. Yeh	VI	1992	Thailand	C. Chantalakhana
VII	1994	Indonesia	E. Soetirto	VIII	1996	Japan	T. Morichi
IX	2000	Australia	J. Ternouth	X	2002	India	P. N. Bhat
XI	2004	Malaysia	Z. A. Jelan	XII	2006	Korea	I. K. Paik
XIII	2008	Vietnam	N.V. Thien	XIV	2010	Taiwan	L.C. Hsia
XV	2012	Thailand	C.Kittayachaweng	XVI	2014	Indonesia	Yudi.Guntara.Noor

Remark from Chairman of the 16th AAAP Congress

Dear all of the scientists, delegates, participants, ladies and gentlemen,

As the host of the 16th AAAP Animal Science Congress, we do impress, thankful, and present a high appreciation for your participation in joining the 16th AAAP Conference in Yogyakarta, Indonesia. We can see the very great enthusiasm of all the scientists to solve livestock problems as well as to share valuable information and knowledge for human prosperity all over the world.

A large numbers of representatives are participating in this conference, which indicates that the interest in the field of animal science is continuously increasing among member countries. We have invited some Plenary Speakers and Invited Papers who are qualified as scientists and bureaucrats in animal science field to share their valuable information and knowledge. Other participants can deliver their precious research through oral and poster presentations. This congress is also paralleled to symposium held by livestock organization and institution as well as some academic meetings.

The theme of the 16th AAAP Congress is "Sustainable Livestock Production in the perspective of Food security, Policy, Genetic Resources and Climate Change". We believe that animal production in Asia and Australasia has become important and strategic sector to provide high quality food, opening up job opportunities, as well as improving farmer's welfare. Animal science socities, therefore, have to support this growing interest by providing more appropriate and relevant technologies to improve efficiency of resources utilization to produce more animal protein food by member countries. Long term sustainable livestock production will, therefore, be significantly influenced by the national food policy, climate change issues, as well as conserved environments and genetic resources.

On behalf of 16th AAAP Committee and all associates, we wish all of the participants having a great achievement of success and fulfill the expectation as well as enjoying the interaction with all scientists participating the Congress.

High appreciation we may acknowledge to all of sectors, especially for His Majesty of Royal Palace of Yogyakarta, Sri Sultan Hamengku Buwono X, and Rector of Universitas Gadjah Mada, who have concerned to facilitate the Congress site host. Special thank to the Steering Committee, Scientific Committee, Reviewers and Editorial Boards for their great contribution to make the Congress successfully organized.

To you, your excellencies, invited guests and delegates, thank you for choosing to come to this conference and to Indonesia. We hope the arrangements we have put in place meet with your requirements. We wish you fruitful deliberations and an intellectually and socially rewarding stay in Yogyakarta.

We are looking forward to meeting you all in the future congress to continue.

Terimakasih (Thank you)

Budi Guntoro

Chairman of the 16th AAAP Congress

16th AAAP PRESIDENT'S REPORT

Selamat pagi!

Dear Ladies and Gentleman

Attendants of 16 AAAP congress:

It is my great pleasure and honor to welcome all of you at The 16th AAAP Congress on November 10 – 14, 2014 at Grha Sabha Pramana, Universitas Gadjah Mada, Yogyakarta Indonesia. This Congress is jointly organized by The Indonesian Society of Animal Science (ISAS), Indonesian Agency for Agricultural Research and Development, Indonesian Directorate General of Livestock and Animal Health Services-Ministry of Agriculture and Faculty of Animal Science Universitas Gadjah Mada. Universitas Gadjah Mada Campus is located in Yogyakarta, one of the Special Region in Indonesia where culture and tradition live in harmony with the modern nuance and educational spirit makes it a beautiful venue of this Congress.

The 16th AAAP Program consists of scientific and technical programs as well as social and cultural activities. The scientific and technical programs offer five plenary sessions, two satellite symposia, field trip, and many scientific sessions, both oral and poster presentations.

During this event distinguished scientists from all over the world will present plenary papers ranging from livestock policy, food security, local genetic resources, climate change, animal welfare, international trade, as well as global research agenda. I believe that around 1,200 scientists as well as livestock producers, companies, graduate and postgraduate students from 40 countries are attending the Congress and more than 770 research papers will be presented. The Congress also provides not only opportunities to discuss and exchange information and experience with scientists from different regions of the world, but also a good environment to build up friendship between nations is our ultimate goals for the Congress outcome. Moreover, this congress also keeps its tradition to be a forum of communication among researchers, academician, industries and related stakeholders among Asian-Australasian countries.

The social and cultural programs are specially desgined to be very important for the congress participants since the promotion of friendship and future scientific cooperation are also central to this AAAP Congress. The Opening Ceremony will offer you the Congress Program at a glance. In addition, participants will also join at a warm Welcome Dinner gathering at Keraton Yogyakarta. Sri Sultan Hamengku Buwono X, His Majesty of The Royal Palace of Yogyakarta will give you the most memorable moment during this event.

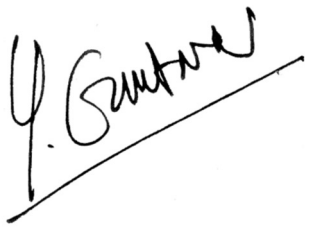
Moreover, cultural night offers us an opportunity to introduce significant culture from participants' countries and gives a spectacular performance to enjoy in order to strengthen our friendship and future cooperation. Field trip, on the other hand, provides a wonderful sightseeing to the most valuable ancient heritage around Yogyakarta, such as Borobudur and Prambanan Temples, and more other interesting places to visit. I do hope that you enjoy your stay in Yogyakarta and not miss all of these spectacular opportunities.

Closing Ceremony will be held on November 14, 2014 immediately after the last session of presentation. During this great moment we will welcome the next host of the 17th AAAP Congress to deliver a brief message. The AAAP Congress Award will provide and announce some participant who receive appreciation for their valuable research.

With all of our hospitability, we will try our best to make your brief visit to Yogyakarta and our beautiful country Indonesia, become a wonderful experience and memorable moments.

I wish you all a very pleasant and most enjoyable stay in Yogyakarta, Indonesia.

Terima kasih (Thank you).



Sincerely Yours
Mr. Yudi Guntara Noor
President
The 16th AAAP Congress

PREFACE

The proceedings of the 16th Congress of the Asian-Australasian Association of Animal Production Societies (AAAP) held on 10-14 November 2014 at Grha Sabha Pramana, Universitas Gadjah Mada, Yogyakarta, Indonesia, consist of two volumes. Those are Volume I of Plenary and Invited Papers and Volume II of Abstracts Contributed Papers. This is the second volume of the proceedings that contains a total of 754 abstracts, consist of 368 papers for oral presentation and 386 papers for poster. Papers were categorized into various disciplines, such as Nutrition and Feed Technology; Genetics and Reproduction; Physiology, Animal Welfare and Health Management; Product Technology and Food Safety; Waste and Environmental issues; Forage Agrostology; as well as Agribusiness, Marketing, Extension and Community Development. The scientific committee has initially received a total of 1,028 abstracts from 42 countries. After reviews have been made, 60 of them were rejected and 74 were cancelled by the authors. The reviewers consist of 4 international and 71 internal reviewers from 6 universities and 1 research institute in Indonesia. In the interest of time limitation for proceedings publication, we apologize for not including 140 submitted abstracts in the proceedings since they were not being followed up with full manuscripts until the extended due date we offered.

The scientific committee would like to thank all the reviewers and appreciate their effort to make significant contribution in reviewing the full manuscripts. Similarly, we would also like to thank supporting staffs at the secretariat office of the Faculty of Animal Science, Universitas Gadjah Mada as well as of the Indonesian Center for Animal Research and Development who have helped in the preparation of the proceedings. Finally, we would like to thank all the authors for their valuable contribution to the congress and make it useful for our societies.

Editorial Team

Biological Delignification by *Phanerochaete Chrysosporium* with Addition of Mineral Mn and Its Effect on Nutrient Content of Oil Palm Frond

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ABSTRACT

The experiment was conducted to study the interaction between mineral Mn and time of fermentation with *P.chrysosporium* on nutrient and fiber components of Oil Palm Frond (OPF). This research was done based on Completely Randomized Design with 2 factor as treatments where every treatment is repeated for three times. The first factors were Mn doses (0, 100, 200 and 300 ppm), while the second factors were time of fermentation (10, 15 and 20 days). Result of research showed there were interaction between mineral doses with time of fermentation on dry matter, organic matter, crude fiber, cellulose, hemiselulose, ADF, NDF and lignin contents. There was no interaction between mineral doses with time of fermentation on crude protein and crude fat content. The results indicated that the best combination is 15 days time of fermentation and 100 ppm Mn dose due to low lignin content.

Key Word: Biological delignification, Oil palm frond, Nutrients content, *Phanerochaete chrysosporium*

INTRODUCTION

An Oil Palm Frond (OPF) was available in large quantities at all times. Utilization of OPF as feedstuff was very limited because of high lignin content (30.18%). Lignocellulose is a macromolecular complex consisting of lignin, cellulose, and hemicellulose. The degradation of lignin is the key step to lignocellulose transformation (Zeng et al., 2013).

White-rot fungus *Phanerochaete chrysosporium* is the most active lignolytic organism. *P. chrysosporium* and its extracellular lignin-degrading enzymes have been investigated intensively because of their great delignifying potential (Arora et al., 2002). The presence of manganese seems to be crucial for the function of Mn (Baldrian et al, 2005). The purpose of this studi was to evaluate the effect of Mn minerals doses and time of fermentation of OPF fermented by *P.chrysosporium* on nutrient content.

MATERIALS AND METHODS

Substrate used in this research was OPF that has been cut and dried, and then finely milled. Source of Mn minerals was in $MnSO_4.H_2O$. *Phanerochaete chrysosporium* was maintained on Potato Dextrose Agar (PDA) slants at 4^0C and then transferred to PDA plates at 37^0C for 6 days, subsequently grown on rice bran. The fermentation process begins by adding water to the OPF so that the water level reaches 65% (Kerem et al., 1992), then added Mn according to treatment.

The proximate components were determined according to AOAC (1995) using Foss equipments (Sweden).The predominantly fiber residues (hemicelluloses, cellulose, and lignin) was determined by the method of Van Soest (1991) using Foss Fibertec 2010 (Sweden). The research used Completely Randomized Design 3 x 4 factorial pattern of each repeated 3 times. The first factor is the time of fermentation (10, 15 and 20 days), the second factor is the levels of Mn (0, 100, 200 and 300 ppm). The differences between treatments were tested by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Dry matter and organic matter. The addition of 100 ppm Mn with 10 days fermentation resulted the highest of dry matter (DM) and organic matter (OM) content. The cycle of availibility nutrient during the fermentation process will change DM due to the degradation process and the utilization of nutrients by the fungus. Moisture content significantly affected lignin degradation. Lignin was degraded 6% higher at 75% and 80% moisture than of 65% after 14 days (Shi et al., 2008).

Tabel 1. Proximate components of Oil Palm Frond fermented by *P.chrysosporium*

Time	Mineral Doses Mn (ppm)				Mineral Doses Mn (ppm)			
(days)	0	100	200	300	0	100	200	300
	Dry matter				Organic matter			
10	33.249^{ab}	34.571^{a}	33.155^{ab}	32.300^{ab}	94.737^{a}	94.719^{a}	94.719^{a}	94.398^{ab}
15	32.543^{ab}	33.157^{ab}	31.806^{bc}	31.723^{bc}	94.380^{ab}	93.730^{bcd}	93.885^{bcd}	93.751^{bcd}
20	29.560^{c}	31.999^{b}	30.978^{bc}	31.656^{bc}	94.234^{abc}	93.885^{bcd}	93.409^{d}	93.554^{cd}
	Crude Fat				Crude Protein			
10	3.000	3.333	3.000	3.000	2.655	2.626	2.772	2.655
15	3.333	3.000	3.000	3.333	2.801	2.772	2.801	2.889
20	3.333	3.000	3.667	3.000	2.889	2.830	2.772	2.831
	Crude Fiber				Lignin			
10	38.361^{bc}	32.353^{e}	35.527^{d}	39.009^{abc}	25.460^{abcd}	24.982^{abcd}	25.460^{abcd}	24.535^{abcd}
15	39.216^{abc}	36.601^{cd}	40.986^{ab}	40.471^{ab}	24.353^{bcd}	21.159^{d}	26.609^{abc}	25.472^{abcd}
20	38.614^{bc}	38.032^{bcd}	39.672^{ab}	41.775^{a}	23.228^{bcd}	22.436^{cd}	26.923^{abc}	27.735^{ab}
	Cellulose				Hemicelulose			
10	31.229^{bc}	27.130^{c}	36.333^{ab}	36.337^{ab}	18.469^{a}	13.288^{bc}	7.061^{e}	8.905^{de}
15	36.560^{ab}	37.201^{a}	38.977^{a}	38.849^{a}	15.388^{abc}	13.440^{bc}	12.124^{cd}	16.062^{abc}
20	39.354^{a}	40.385^{a}	38.462^{a}	38.093^{a}	15.877^{abc}	16.524^{ab}	15.614^{abc}	15.107^{abc}
10	31.229^{bc}	27.130^{c}	36.333^{ab}	36.337^{ab}	18.469^{a}	13.288^{bc}	7.061^{e}	8.905^{de}
	NDF				ADF			
10	80.890^{ab}	70.363^{e}	73.366^{de}	78.350^{bc}	58.599^{d}	52.879^{e}	63.062^{bc}	65.610^{ab}
15	78.878^{bc}	75.515^{cd}	82.172^{ab}	84.204^{a}	60.913^{cd}	59.630^{d}	65.586^{ab}	65.602^{ab}
20	81.640^{ab}	83.833^{a}	84.180^{a}	82.822^{ab}	63.223^{abc}	64.744^{ab}	66.667^{a}	66.457^{ab}

Superscripts in the same column and row in each component indicated significantly different (P<0,05)

The OM content of OPF before fermentation was 94.5%, changed during the fermentation, ranging from 93.409- 94.737%. Lopez and Garcia (2006) found that the OM loss from chicken litter compost was 9% of the initial OM. This OM loss was similar to that found by Tiquia et al. (2002) during composting of sewage sludge. The mass of OM and total organic carbon also decreased with composting time (Haddadin et al., 2009).

Crude fat and crude protein. Table 1 showed that crude fat content of fermented OPF was not affected by Mn dose, fermentation time and there was no interaction between time of fermentation with doses of minerals (P>0.05). Jonathan et al. (2012) reported no significant changes in the fat content of rice straw fermented with *P. florida* with different time of fermentation, being 1.47-1.82%. Fermentation time of 20 days resulted in the highest crude protein content (2.830%), but not significantly different compared to that of 15 days (2.816%). Increasing doses of Mn had no effect on the CP content of fermented OPF. This is presumably because the concentration of Mn in the substrate has been exceeding the needs of *P. chrysosporium*.

Crude fiber and lignin. Table 1 showed addition of 100 ppm Mn with 10 days fermentation resulted in the lowest crude fiber content (32.353%). Oil palm frond is a waste and has lignified. Breakdown of lignin involves by lignolytic enzyme from *P.chrysosporium* that will decompose lignin to carbon dioxide (CO_2), using the enzyme of lignin peroxidase and manganese peroxidase (Vallie et al., 1992). Addition of 100 ppm Mn with 15 days fermentation resulted in the lowest lignin content (21.159%), indicated that Mn was able to

decrease lignin content (30.18 vs 21.159%). However, Mn addition more than 200 ppm with 15 days fermentation was not effectively decreased the lignin content. Biodegradation of cotton stalk by *P. chrysosporium* displayed a higher lignin degradation at higher moisture content, although the results did not show the direct relationship of nutrients on the lignin degradation upon a longer fermentation time (Shi et al., 2008). Most of the lignin degradation occurred during 4–10 days and delignification rates varied over the 14 days pretreatment period due to fungal metabolism as well as that Mn addition can not increase ligninolytic activity (Shi et al., 2009). In this case that excess nutrients, especially Mn^{2+}, may inhibit fungal growth and delignification.

Cellulose and hemicellulose contents. Combinations of 100 ppm Mn addition with 10 days of fermentation resulted in the lowest cellulose content (27.13%). The decrease in cellulose content indicates cellulase activity of the enzyme produced by *P.chrysosporium.* The decrease in cellulose content occurred on day 10, then the cellulose content increased along with length of fermentation time. Therefore, the inoculation during the second fermentation phase (day 15 to 42) was more effective than that during the first fermentation phase (0–14 days) (Zeng et al., 2010). Feng et al. (2011) stated that cellulose were degraded slightly during the initial phase of composting (0–6 days), while rapid decomposition were identified during the thermophilic phase. The decrease of cellulose content followed by decrease in ADF content. The addition of 100 ppm Mn with 10 days of fermentation produces the lowest ADF (52.879%). This in agreement with the statement of Tuomela et al. (2000) that the utilization of readily soluble materials was occurred in the early phase of fermentation. Hemicellulose content of OPF before fermentation is 11.912%, and fluctuated during fermentation time (7.061% - 18.469%). Lopez et al. (2013) found an increase the hemicellulose content of 44,44% corn cobs inoculated with *P. flavido alba* compared with controls (14.0% vs. 25.2%).

NDF and ADF contents. Fermentation and mineral doses significantly ($P < 0.05$) influenced the content of NDF and ADF. Combinations of 100 ppm Mn with 10 days of fermentation resulted in the lowest NDF and ADF content, being 66.457% and 52.879%, respectively. The decrease of NDF content was 18.87% (81.92% vs. 66.457%) and ADF 24.46% (70% vs. 52.879%) compared with the NDF and ADF of OPF before fermentation. These were lower than of Haddadin et al. (2009) who reported a decrease in NDF and ADF contents, being 31.64% and 39.74% respectively on Olive Pomade fermented by *P.chrysosporium* fungus for 10 days. The decrease in NDF and ADF content after fermentation was caused by the breakdown of the cell walls of fungi *P. chrysosporium* which leads to changes in the content of the fiber fraction.

CONCLUSIONS

There were interaction between Mn doses with time of fermentation on dry matter, organic matter, crude fiber, cellulose, hemicellulose, ADF, NDF and lignin contents of OPF and there were no interaction between Mn doses with time fermentation for crude protein and crude fat content of OPF. The time of fermentation 15 days and 100 ppm Mn was the best combination treatment due to the lowest lignin content of OPF.

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